MAS Software Engineering
A Division of the Maintenance Directorate
A CMM Level 3 Organization

EC-130H Compass Call Software Support
An application of the SOF EISE Concept

WR-ALC/MASS
Special Operations Forces (SOF)

WR-ALC/MAS
David W. Smith
Thomas F. Christian Jr.
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Overview

MAS Software Engineering
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- SOF EISE Current Capabilites
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- Summary

MAS Software Engineering Division

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- Mission: "Provide Innovative, Affordable Software Solutions Vital to the Mission Success of Our Customer"
  - All DMAG Software Activities Consolidated in MAS
  - Software Engineering Domains
    - > Operational Flight Programs (OFPs)
    - > Software Engineering Environments (SEEs)
      - * Software Development Environments (SDE)
      - * System Integration Laboratories (SIL)
    - > Test Program Sets (TPSs)
    - > Automatic Test Equipment (ATE)
    - > Trainers
    - > Mission Planning
    - > Database
    - > Web-Based Development
    - > Computer Resources
  - Software Engineering Institute (SEI) Capability Maturity Model (CMM)
    - Level 3 (April 2000)
  - International Projects (ISO 9001 Compliant – Certified 2001)

Software Lifecycle Capabilities

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- Complete Software Development Capabilities
  - Requirements Analysis through Fielding of Software
  - Software Development, Modifications and Maintenance
    - Partnering or Non-Partnering
- Extensive System and Software Test Capabilities
  - Component Level Testing through Operational Test and Evaluation Support
  - State of the Art Software Engineering Environments
    - High Fidelity Models and Simulations
    - In Circuit Emulators
    - Data Recording/Reduction/Analysis
- Comprehensive Software Project Management Capabilities
  - Project Mgmt, Requirements Mgmt, Risk Mgmt, SCM, QA, Documentation
  - COTS Management Tools
  - Customized Project Management Accounting Tools

WR-ALC/MASS Special Operations Forces OFP Branch

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- SOF Support Activities
  - MH53J/M Pave Low III/IV
  - HH-60G Pave Hawk
  - AC-130H Gunship
  - MC-130H Combat Talon II
  - MC-130E Combat Talon I
  - EC-130H Compass Call

SOF Support Activities

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- Operational Flight Program Modification/Maintenance
  - Modification Programs
    - Partnering
    - Non-Partnering
  - Block Cycles
  - Out of Cycle or Emergency Changes
  - Safety Review Board/Accident Review Board Investigations/Analyses
- Software Engineering Environment (SEE) Modification/Maintenance
  - Extendable Integration Support Environment (EISE)
  - Software Development Environment (SDE) Tools
- Mission Planning Software Maintenance
- Trainer Software Maintenance
- Independent Verification and Validation
- Software Acquisition Support
- Software Engineering Services

SOF EISE Simulation Networks

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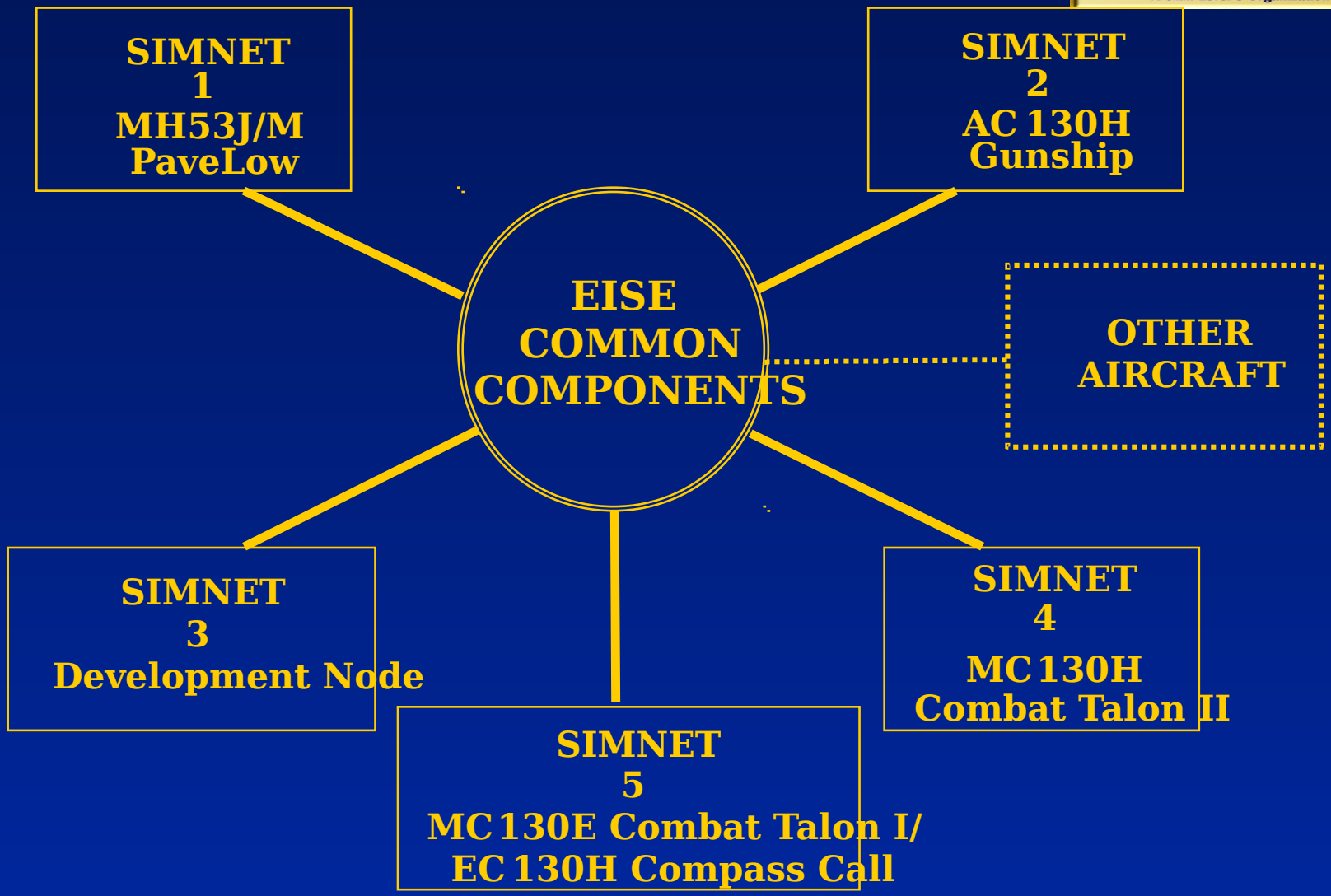
SIMNET 1 MH53J/M PaveLow
SIMNET 2 AC 130H Gunship
EISE COMMON COMPONENTS
OTHER AIRCRAFT
SIMNET 3 Development Node
SIMNET 4 MC 130H Combat Talon II
SIMNET 5 MC 130E Combat Talon I/ EC 130H Compass Call

SOF EISE Current Capabilities

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- Supports Five SOF Weapon Systems with single System Integration Facility (~2.75M SLOC)
  - Uses High-Fidelity Software Models and Simulations to Perform Real-Time OFP Testing
    - Based on high performance single-board computers and COTS components, reflective memory and open, expandable system architecture
- Benefits
  - Reliable, repeatable environment for OFP testing, troubleshooting, problem verification and rapid prototyping
  - Shares high cost software simulation components across multiple platforms
  - Facilitates the integration of new or modified LRUs into the Avionics suite
    - Short upgrade time (Typical LRU simulation development = 3 months)
  - Expandability offers flexibility for future system support or “Split-Fleet” support of current systems
  - Greatly reduces flight test requirements

MH-53J Pave Low III Simulation Library (IOC - November 1995)

MH-53J Avionics Simulations

Radar

APN-221 Doppler
APQ-158 Multi-mode Radar

Navigation

ARN-151 GPS
APN-232 Radar Alt
ARN-118 TACAN
C-12 Magnetic Compass
AN/ARN-58 VOR
DF-3018 UHF D/F Receiver
ASN-143 Inertial

Sensors

AAQ-18 FLIR
Electronic Warfare
Integrated EW Mission Processor

MH-53J/M Electronic Cockpit Simulations

Power Panel
C-12 Magnetic Compass Panel
ADF Control Panel
VOR/ILS Control Panel
TACAN Control Panel
MMR Control Panel
Navigation/FLIR Control Panel
Doppler No. 1/2/3 Panel
VSDS Panel
Pilot 1/2/3/4 Panels

Environment/Flight Simulation Library

- **Executive Scheduler**
- **Physical Environment**
- **Flight Controls**
- **Sensors (Various)**
- **Flight Control Surfaces**
- **Propulsion**
- **Aerodynamics**
- **Mass Properties**
- **Take Off and Landing**
- **Flight Dynamics**
- **Scenario Processing**
- **Target Models**
- **Terrain Model**

AC-130H Gunship Simulation Library (IOC - August 1997)

AC-130H Avionics Simulations

Radar

APN-218 Doppler
APQ-150 Beacon Tracker

Navigation

ARN-151 GPS
APN-232 Radar Alt
C-12 Magnetic Compass
LN-93 INU
H-423 INU
SKN-2443 INU
Miniature Air Data Com

Sensors

AAQ-17 FLIR
AAQ-26 FLIR
ARS-6 PLS
AVQ-19 LTD
AJQ-24 Laser Ranger
ASD-5 Black Crow
ASQ-145 LLLTV EW
AAR-44 IRWR

Armament

M-61 20mm Gun
M-2 40mm Gun
M-102 105mm Gun
AWG-22/23 Trainable

AC-130H Electronic Cockpit Simulations

Black Crow Panel
Beacon Tracking Radar Panel
TV/IRWR Panel
FLIR Panel
Fire Control Officer Panel

Engine Panel
Pilot No. 1/2 Panels
Power Panel
C-12 Magnetic Compass Panel
Manual Flight Panel with Autopilot

MC-130H Combat Talon II Simulation Library (IOC - September 1998)

MC-130H Avionics Simulations

Radar

APQ-170 TF/TA

Navigation

ARN-151 GPS
APN-232 Radar Alt
C-12 Magnetic Compass
LN-93 INU
H-423 INU
SKN-2443 INU
ARN-118 TACAN
ARN-147 VOR/ILS
DF-206 Auto DF
OA-8697 UHF DF

Sensors

AAQ-26 FLIR
AAR-44 IRWR
AAQ-15 FLIR

Communications

ARC-190 HF Radio
KY-58/KY-100 Crypto
ARC-186 VHF AM
ARC-164 UHF HQ
ARC-222
ARC-187 SATCOM
DAMA Modem
Remote Interface Unit
Tank Electronic Control

MC-130H Electronic Cockpit Simulations

Power Panel
Control Wheel Panel
Pilot No. 1/2 Panels
Engine Panels
Throttle Control Panel
WCA No. 1/2/3/4 Panels
Air Refueling System Panel
IRWR/EWO/Nav Panel
MMR Panel
Air Drop Panel
C-12 Magnetic Compass Pane
FLIR Panel
Manual Flight Panel with Aut
TACAN Control Panel

MC-130E Combat Talon I Simulation Library
(IOC - September 1999)

MC-130E
Avionics
Simulations

Radar
APQ-122 TF/TA

Navigation
ARN-151 GPS
C-12 Magnetic Compass
LN-93 INU
H-423 INU
SKN-2443 INU
HG-9050 Radar Alt
APN-218 Doppler
Air Data Computer

Sensors
AAR-44 IRWR

MC-130E
Electronic Cockpit
Simulations

Power Panel
ADC Control Panel
RWR Control Panel
DSC Control Panel
Engine Panel
Nav Power Panel
Doppler Panel
MMR Panel
VSDS Panel
Pilot 1/2 Panels
C-12 Magnetic Compass
Manual Flight Panel with Autopilot

EC-130H Compass Call Overview

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- EC-130H Compass Call is a highly modified version of Lockheed Martin's C-130 aircraft utilizing a mixture of mission unique systems and common Air Force avionics.
- EC-130H was first deployed in July 1980.
- EC-130H Compass Call provides a non-lethal means of denying and disrupting enemy command and control, degrading their combat capability and reducing losses to friendly forces.

EC-130H Compass Call Commonality Analysis

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- Evaluated System Documentation to determine Avionics configuration of Compass Call.
- Determined Commonality between existing EISE platforms and Compass Call
- Determined Hardware/Software Modifications Needed to incorporate Compass Call into Existing Combat Talon I node
- Entire Commonality Analysis Effort was approximately 80 man-hours
- Results of Analysis: 95% Reuse
  - 100% Reuse of 69% of the simulations
  - Modification Reuse of 26% of the Simulations
  - 1 New Model Required

EC-130H Compass Call Simulation Library (IOC – April 2003)

EC-130H
Avionics
Simulations

Navigation

ARN-151 GPS
C-12 Magnetic Compass
LN-93 INU
H-423 INU
SKN-2443 INU
APN-232 Radar Alt
APN-218 Doppler
Air Data Computer

Sensors

AAR-44 IRWR

Weapons

HBS*
DF*
Sub A*
Sub B*
Sub C*
Sub D*

EC-130H
Electronic Cockpit
Simulations

Power Panel
ADC Control Panel
Engine Panel
Nav Power Panel
Doppler Panel
Pilot 1/2 Panels
C-12 Magnetic Compass
Manual Flight Panel with Autopilot

*** Based off of a common model**

Summary

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- SOF EISE Facility provides a high fidelity, reliable and flexible environment that can be used to support additional weapon systems.
- Software Simulations can be reused across multiple platforms thereby saving time and software support funding.
- Addition of the EC-130H Compass Call weapon system prompted creation of a generic 1553 Bus simulation that facilitates rapid OFP development.